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Altmann et al.

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(54) **ACTUATING ASSEMBLY FOR AN OPERATING ELEMENT, STEERING COLUMN SWITCH, AND STEERING COLUMN ASSEMBLY**

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B60Q 1/14 (2006.01)
G05G 1/04 (2006.01)

(52) **U.S. Cl.**
CPC ***G05G 5/06*** (2013.01); ***B60Q 1/1469*** (2013.01); ***G05G 1/04*** (2013.01); *Y10T 74/20606* (2015.01); *Y10T 74/20636* (2015.01)

(58) **Field of Classification Search**
CPC G05G 5/06; G05G 1/04; H01H 21/02; H01H 3/16; B60Q 1/1469
(Continued)

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,300,852 B1 * 10/2001 Kato B60Q 1/1469 200/327
2004/0144630 A1 7/2004 Heinze et al.
2006/0185467 A1 * 8/2006 Giefer F16H 61/24 74/532

FOREIGN PATENT DOCUMENTS

DE 10148554 3/2003
DE 10160801 * 6/2003 ..... H01H 25/04
(Continued)

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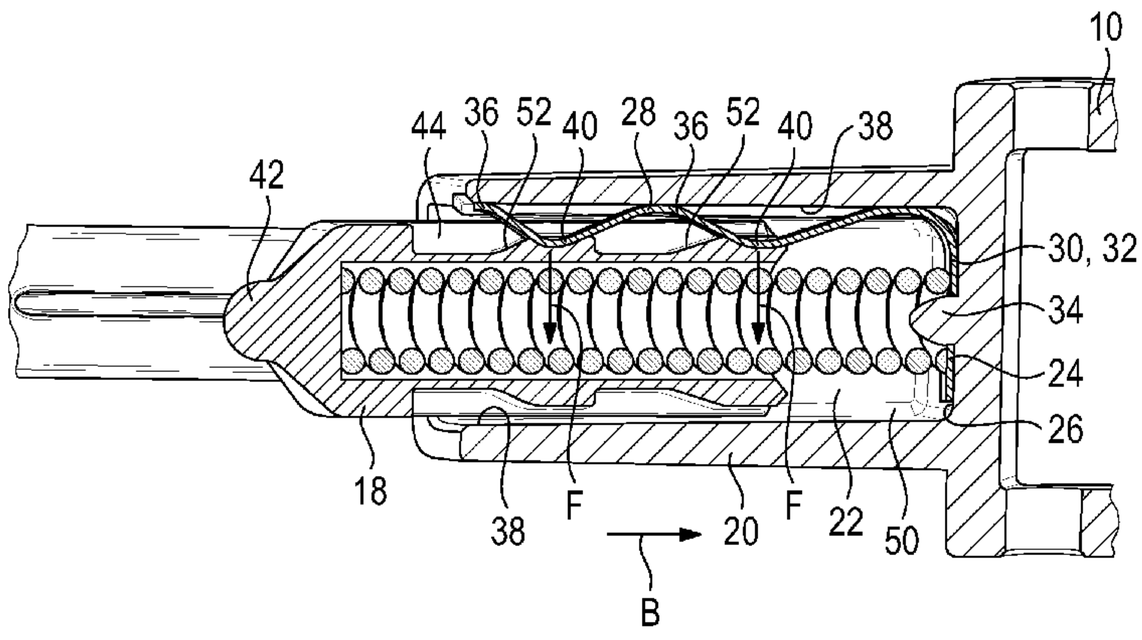
(57) **ABSTRACT**

In an actuating assembly (**16**) for a control element in a vehicle, in particular for a steering column stalk (**10**), having an actuating element (**18**) that is adapted to be shifted in an actuating direction (B), and a seat (**20**) in which the actuating element (**18**) is supported for being shifted hi the actuating direction (B) between a basic position and at least one actuation position, at least one separate spring element (**28**) is provided between the seat (**20**) and the actuating element (**18**) and presses on the actuating element (**18**) by a spring force (F) acting substantially transversely to the actuating direction (B).

21 Claims, 3 Drawing Sheets



(58) **Field of Classification Search**
USPC 200/61.54–61.57, 61.27–61.35
See application file for complete search history.

(56) **References Cited**

FOREIGN PATENT DOCUMENTS

DE	102007008960	*	8/2008	..... B60K 20/02
DE	102009058719		6/2011	
JP	S50-31528		3/1975	
JP	S62-28222		2/1987	
WO	2005/031491		4/2005	

* cited by examiner

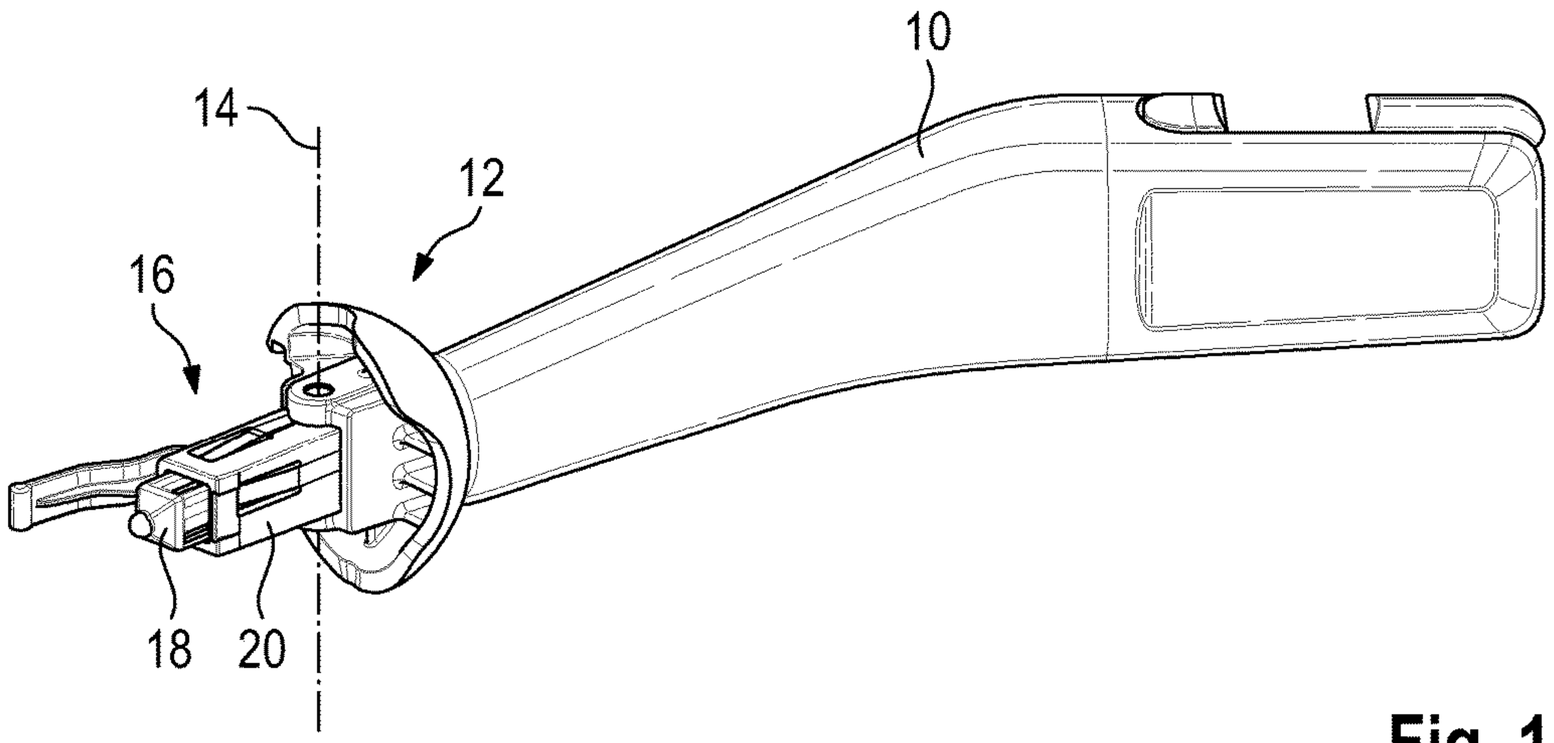


Fig. 1

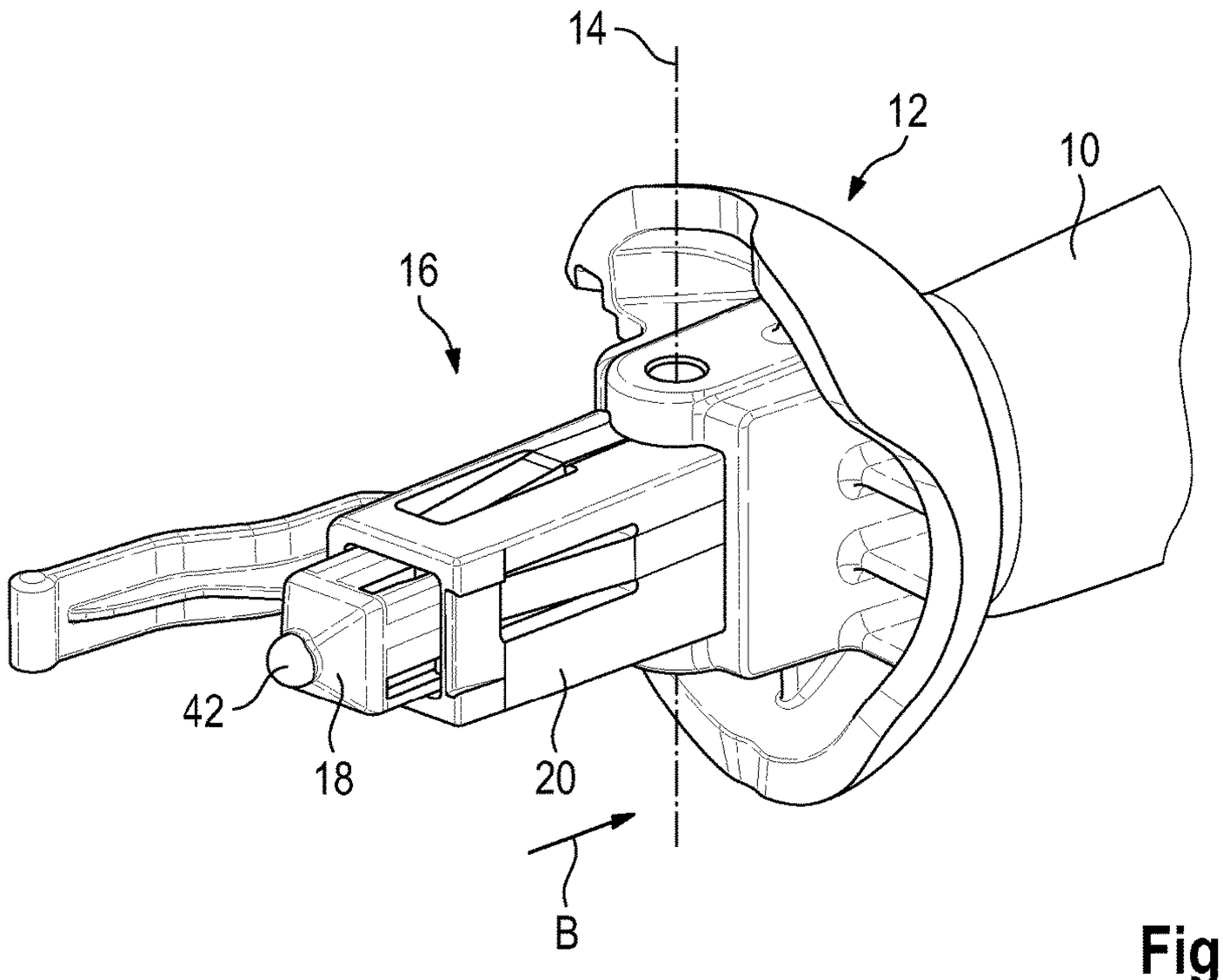
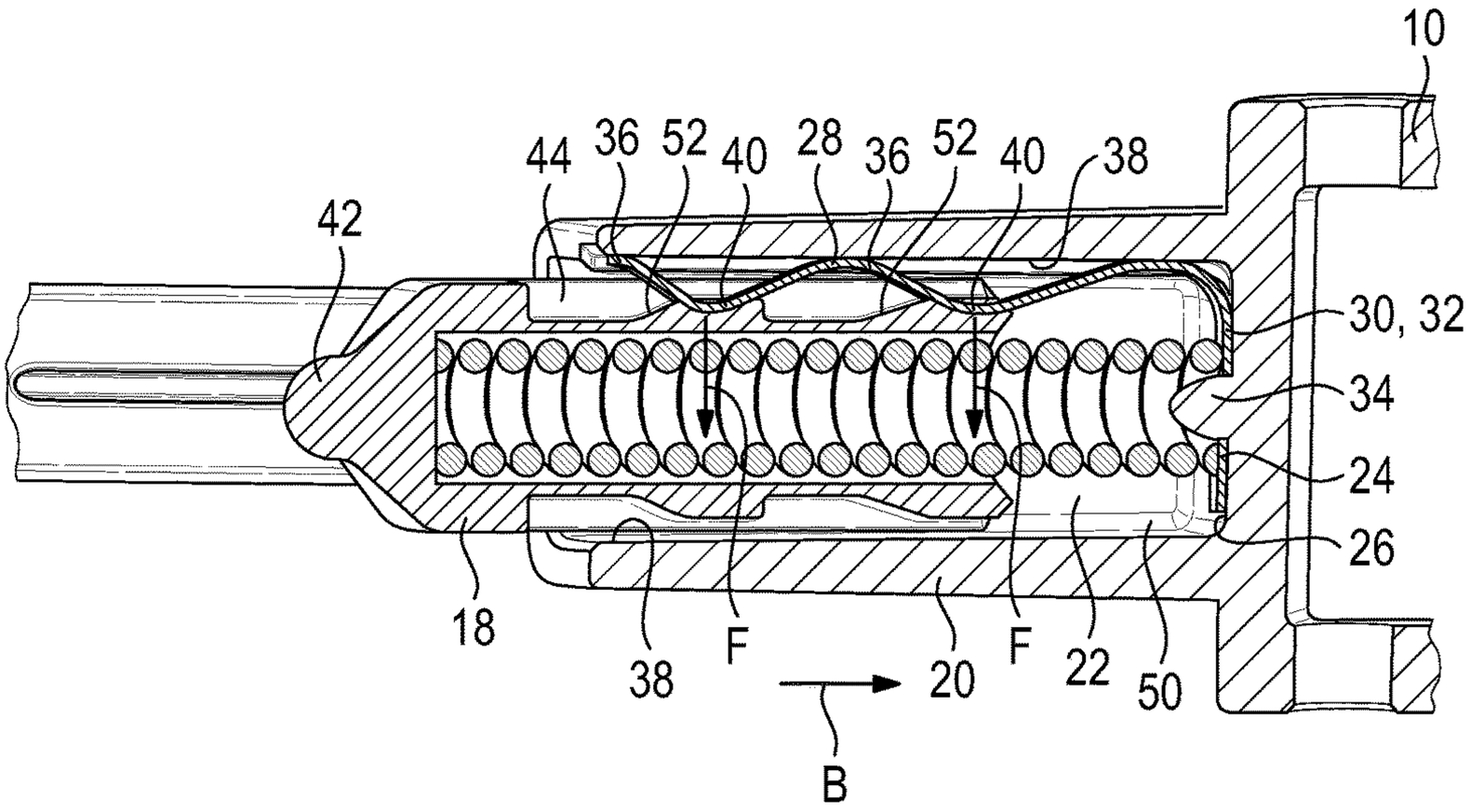


Fig. 2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30, 32
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24
26
18
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F
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22
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B

Fig. 3

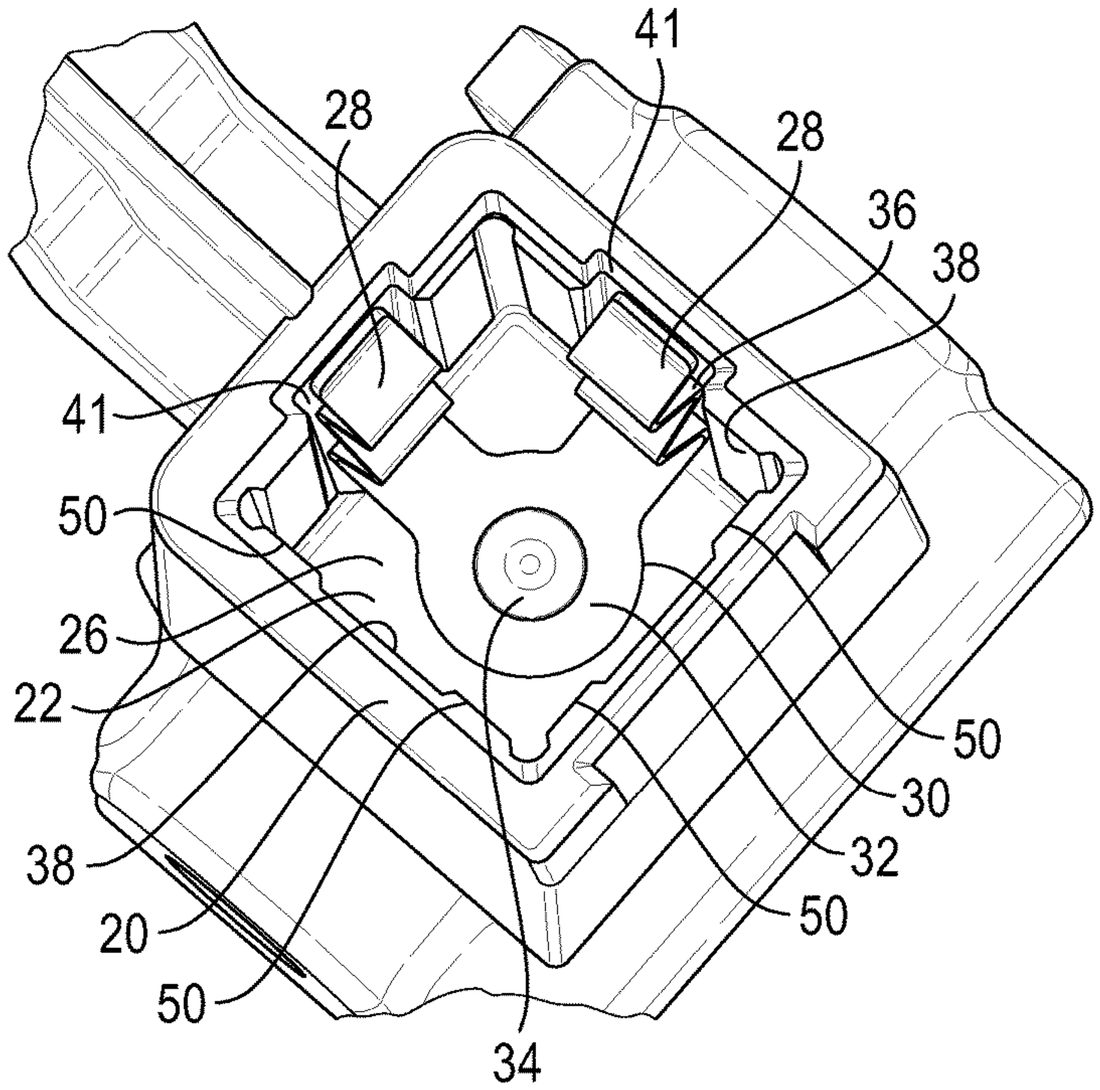
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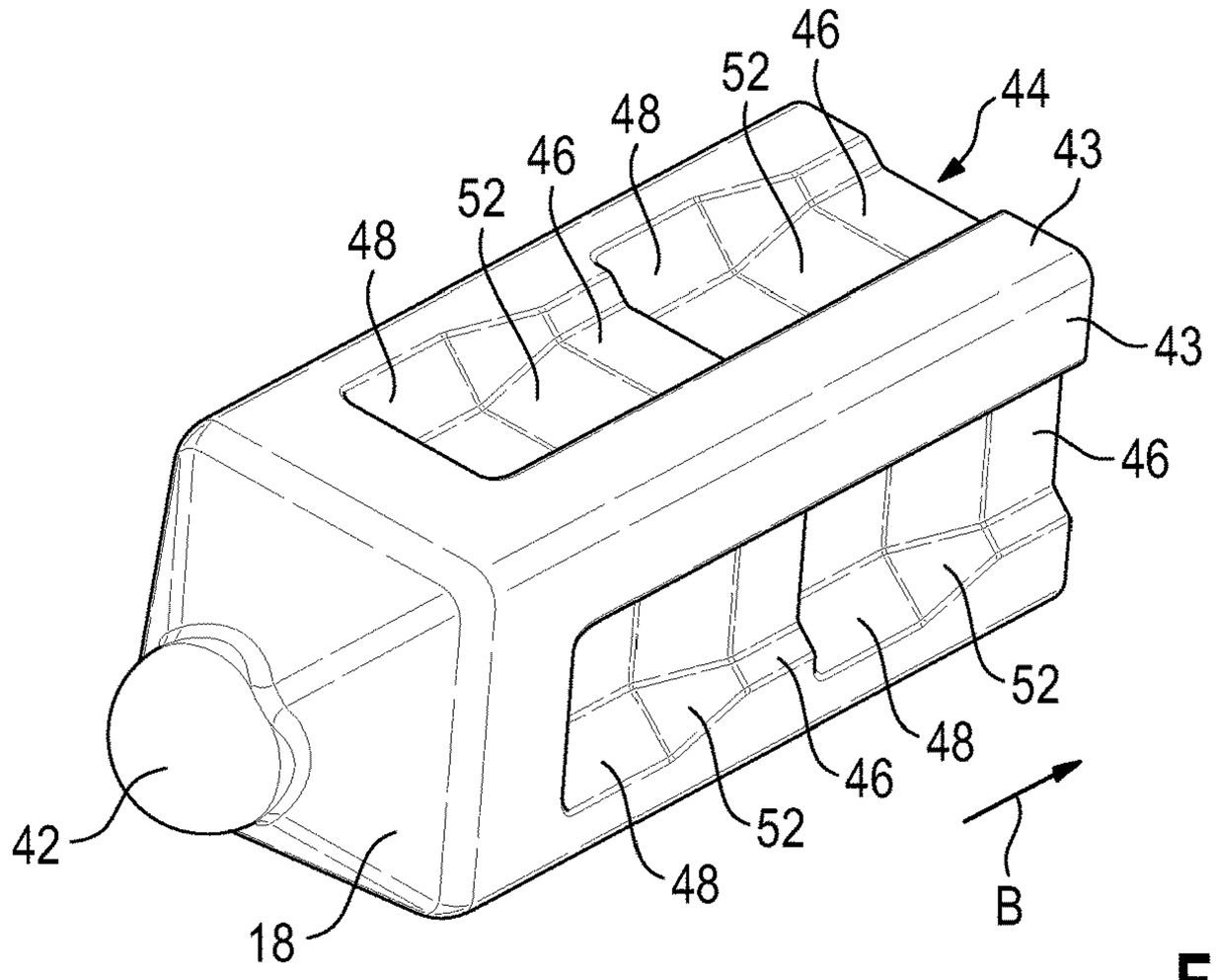
Fig. 4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18
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Fig. 5

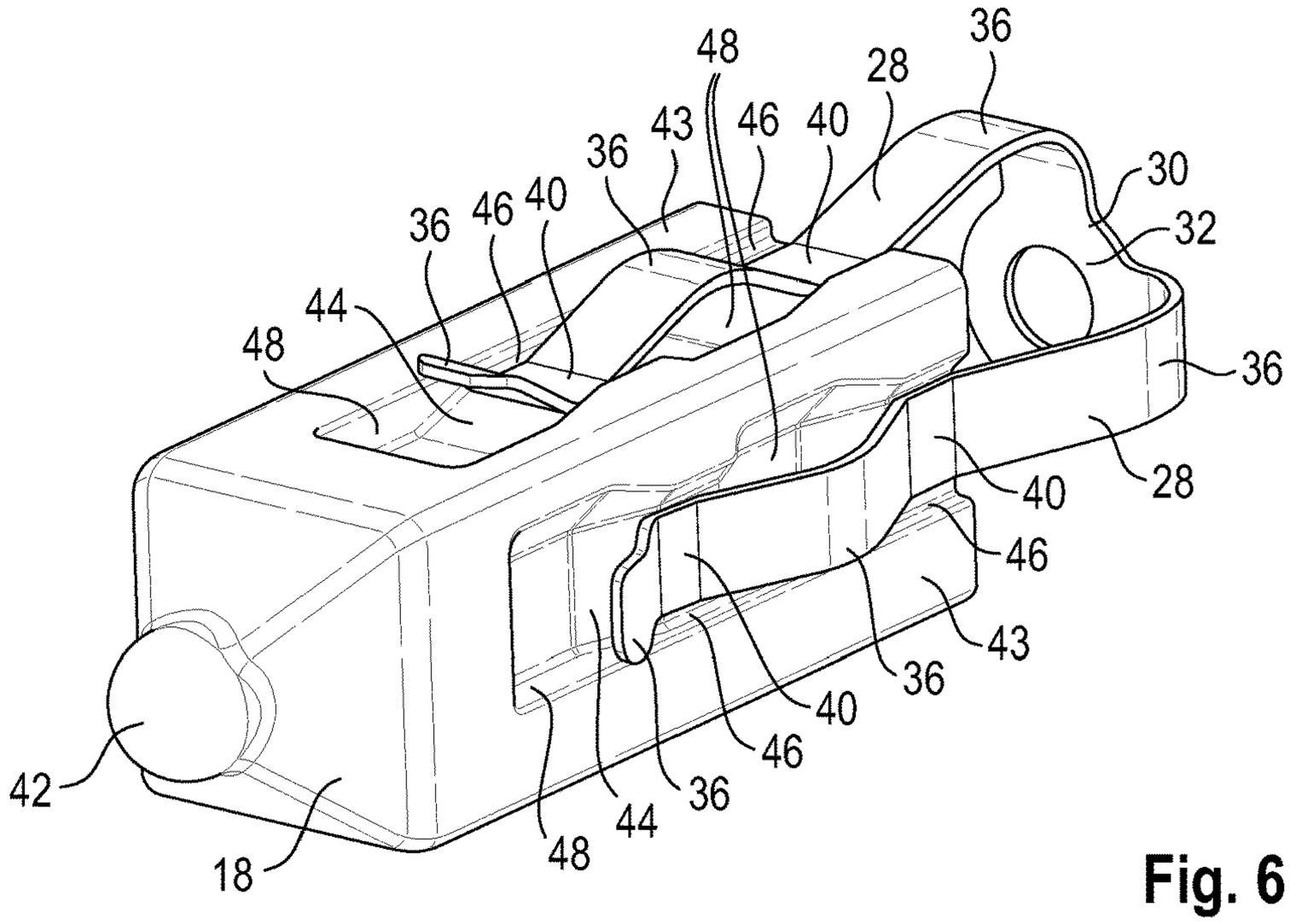
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Fig. 6

ACTUATING ASSEMBLY FOR AN OPERATING ELEMENT, STEERING COLUMN SWITCH, AND STEERING COLUMN ASSEMBLY

RELATED APPLICATIONS

This application corresponds to PCT/EP2013/072069, filed Oct. 22, 2013, which claims the benefit of German Application No, 10 2012 021 261.5, filed Oct. 29, 2012, the subject matter, of which are incorporated herein by reference in their entirety.

BACKGROUND OF THE INVENTION

The present invention relates to an actuating assembly for a control element in a vehicle, in particular for a steering column stalk, including an actuating element that is adapted to be shifted in an actuating direction between a basic position and at least one actuation position, and a seat in which the actuating element is shiftably supported. The invention further relates to a steering column stalk for a vehicle and a steering column stalk assembly.

In many vehicles provision is made for steering column stalks, which may be made use of to control a variety of vehicle functions such as, e.g., a windshield wiper or a direction indicator. The steering column stalk is typically arranged for swiveling or pivoting motion in a vehicle-fixed bearing and includes an actuating element that is supported in a seat so as to be shifted in the longitudinal direction of the steering column stalk. The vehicle-fixed bearing is provided with a detent cam surface into which the actuating element is pressed by a spring. Various non-locking keys or contacts for the actuating element may be provided in the detent cam surface. When the steering column stalk is pivoted, the actuating element is shifted on the detent cam surface; in the process, a non-locking key can be operated or an electric connection can be established via a contact, and in this way different vehicle functions can be enabled or disabled.

To avoid undesirable rattling noises and to increase ease of operation, it is required that the steering column stalk and the actuating element should be supported with as little clearance as possible. On the other hand, no excessive friction must be produced between the actuating element and the seat since otherwise the operating forces would increase.

Disclosed in the prior art are actuating assemblies in which portions of the seat or the actuating element are made to be elastic and the actuating element is elastically clamped in the seat. One drawback of these actuating assemblies is the high friction between the actuating element and the seat. Furthermore, due to the friction involved, they are subject to high wear, so that as the service life progresses, friction is reduced and clearance increases. Reducing the clearance is only possible by exchanging the entire stalk.

SUMMARY OF THE INVENTION

It is the object of the invention to provide an actuating assembly for a steering column stalk, which exhibits a small clearance of the actuating element over the entire service life. A further object of the invention is to provide a steering column stalk and a steering column assembly having such an actuating assembly.

To achieve the object, in an actuating assembly for a steering column stalk, including an actuating element that is adapted to be shifted in an actuating direction between a basic position and at least one actuation position, and a seat in which the actuating element is shiftably supported, provision is made for at least one separate spring element between the seat and the actuating element, the spring element pressing on the actuating element by a spring force acting substantially transversely to the actuating direction. The actuating element and the seat are configured to be rigid. The reduction in clearance between the seat and the actuating element is effected exclusively by the spring element which is arranged within the seat and presses the actuating element against the inner wall of the seat. Such a spring element allows any desired adjustment of the spring force acting between the seat and the actuating element, so that a precise adjustment of the freedom from clearance and of the friction acting between the seat and the actuating element is possible. In addition, a separate spring element has the advantage that it can be exchanged by simple means in the event of a decrease in spring force. Furthermore, any wear-induced clearance between the seat and the actuating element can be compensated for by the spring element.

Preferably, guide members that are located substantially opposite the spring element are provided in the seat, the actuating element being pressed against the guide members by the spring element. These guide elements may, for example, be coated such that the friction between the actuating element and the seat is reduced, whereby the actuating element is supported in the seat with low friction. Moreover, the actuating element preferably rests exclusively against the guide members and is not in surface contact with the inner wall of the seat.

The spring element extends, for example, within the seat in the actuating direction and rests against the inner wall of the seat at least in sections. The spring element is supported at the inner of the seat, so that no additional parts are required for mounting the spring element.

The spring element preferably includes protruding sections which project from the we of the seat and rest against the actuating element. The spring element has in particular an undulating configuration, so that individual sections of it rest against the inner wall of the seat and protruding sections of it rest against the spring element. The shape and the height of the undulating spring may be made use of for adjusting the spring force as desired.

At least one projection and/or one depression may be provided on the actuating element. The spring element rests by a protruding section against a projection in the basic position of the actuating element, and/or rests in a depression in an actuation position, for example. Owing to the spring element, which presses the actuating element against the inner wall of the seat, a higher friction is produced between the actuating element and the seat, so that the actuating force for shifting the actuating element increases. When the protruding sections of the spring element move into a depression or are pushed away by a projection, the spring will relax and in this way reduce the friction between the actuating element and the seat. As a result, the actuating force present in the actuation position is lower, but, irrespective of the position of the actuating element, a sufficiently high spring force is exerted on the actuating element, so that it is held within the seat free of clearance.

In such an embodiment, a ramp for the protruding section of the spring element is preferably provided between a projection and a depression located behind the projection in the actuating direction, by which the protruding section can be guided between the projection and the depression. When the protruding section of the spring element moves onto this inclined ramp, the spring element exerts a lower release

force on the actuating element in the actuating direction, by which a holding force produced by the frictional resistance is reduced, so that the actuating element can be moved by applying a lower actuating force.

The spring element may be a bent sheet metal part, for example, which in particular is pre-bent in an undulating shape. In the case of spring elements made of a plastic material, the spring tension may deteriorate in the course of the service life due to the viscoelastic behavior of the plastic material or due to other ageing phenomena. A bent sheet metal part offers the advantage that the pretender of the spring element will not, or only slightly, deteriorate over the service life.

The seat is made to be rectangular or square, for example. The spring element may be arranged at one corner of the square and press the actuating element into the opposite corner of the square. In such an embodiment, one spring element is sufficient for mounting the actuating element free of clearance. Guide elements may be provided on each of the surfaces of the seat which are adjacent to the corner into which the actuating element is pressed. But it is also conceivable that two spring elements are provided, which are more particularly arranged offset by 90 degrees in the circumferential direction. They may be arranged on two adjacent surfaces of the square seat, for example, and press the actuating element against the respective opposite surface.

The spring elements may be formed in one piece, so that only one attachment for the spring elements is necessary within the seat. Where the spring element is a bent sheet metal part, it may have two mutually perpendicularly arranged arms, for example, which are each bent over at a right angle.

According to the invention, further provision is made for a steering column stalk having an actuating assembly according to the invention. The seat of the actuating assembly is preferably provided on the actuating stalk and in particular formed integrally therewith.

According to the invention, further provision is made for a steering column stalk assembly having a steering column stalk according to the invention and a vehicle-fixed bearing for accommodation of the mounting of the steering column stalk, the bearing including a detent cam surface into which the actuating element can engage.

BRIEF DESCRIPTION OF THE DRAWINGS

Further advantages and features will be apparent from the description below in conjunction with the accompanying drawings, in which:

FIG. **1** shows a steering column stalk in accordance the invention;

FIG. **2** shows a detail view of the actuating assembly of the steering column stalk of FIG. **1**;

FIG. **3** shows a sectional view of the actuating assembly of FIG. **2**;

FIG. **4** shows a perspective view of the seat of the actuating assembly of FIG. **2**;

FIG. **5** shows the actuating element of the actuating assembly of FIG. **2**; and

FIG. **6** shows the actuating element of FIG. **5** with a spring element.

DESCRIPTION

FIG. **1** shows a steering column stalk **10** for a vehicle. The steering column stalk **10** includes a mounting **12** by which the steering column stalk **10** can be mounted at a vehicle-fixed bearing so as to swivel about a swivel axis **14**.

The steering column stalk **10** further includes an actuating assembly **16** having an actuating element **18**. The actuating element **18** engages into a detent cam surface on the vehicle-fixed bearing, the detent cam surface having non-locking keys or contacts provided therein. When the steering column stalk **10** is swiveled, the actuating element **18** operates these non-locking keys or engages the contacts, whereby a variety of vehicle functions such as, e.g., a windshield wiper may be controlled.

The actuating assembly **16** has a seat **20** which is formed integrally with the steering column stalk **10** here (see also FIG. **2**). As can be seen in particular in FIGS. **3** and **4**, the seat **20** has a rectangular or square shape in cross-section and includes an accommodation space **22** extending in an actuating direction B, in which the actuating element **16** is mounted for being shifted in the actuating direction B.

Provided in the accommodation space **22** is a spring **24** which is supported against a front face **26** of the seat **20** and urges the actuating element **18** contrary to the actuating direction B into a basic position shown in FIG. **3**. When the steering column stalk **10** is swiveled, the actuating element **18** can be shifted from this basic position to an actuation position by the detent cam surface in the actuating direction B.

As can be seen in particular in FIGS. **3** and **4**, two spring elements **28** are provided in the seat between the seat **20** and the actuating element **18**, which each press the actuating element **18** against the opposite inner wall **38** of the seat **20** with a spring force F.

As is apparent in particular from FIG. **4**, the spring elements **28** are made in one piece from a bent sheet metal part **30**. The bent sheet metal part **30** has a basic section **32** which is attached to a projection **34** on the front face **26** of the seat **20**. The spring elements **28** each protrude from the basic section **32** at rights angles to each other and are bent over at right angles immediately behind the basic section **32**.

In the embodiment shown here, the spring elements **28** have an undulating shape and rest by sections **36** against the inner wall **38** of the seat **20**. Provided between the sections **36** are protruding sections **40** which project from the inner wall **38** towards the actuating element **18** and rest against the actuating element **18**. The spring elements **28** are each held in a groove **41**.

The actuating element **18** also has a substantially square cross-section. A projection **42** is provided on a rear end as viewed in the actuating direction B, the projection **42** being adapted to engage in a detent cam surface provided on the vehicle-fixed bearing.

The side faces **43** of the actuating element **18** are provided with grooves **44** which extend in the actuating direction B and against which the spring elements **28** rest (FIGS. **3** and **6**). Provided in the grooves **44** there are a plurality of projections **46** located one behind the other in the actuating direction B and depressions **48** disposed between the projections **46**.

As shown in FIG. **3** in the basic position the protruding sections **40** of the spring elements **28** each rest against a projection **46** of the actuating element **18**.

The actuating element **18** is therefore pressed against the respective opposite inner wall **38** of the seat **20** by the spring elements **28** with a spring force F, so that the actuating element **18** is mounted free of clearance. The seat **20** and the actuating element **18** each have a rigid configuration. The spring force F, which presses the actuating element **18**

against the inner wall **38** of the seat **20**, is thus provided exclusively by the spring elements **28**.

As can be seen in particular in FIG. **4**, the inner wall **38** is provided with guide members **50** against which the actuating element **18** is pressed. These guide members **50** may be formed such that the friction between the actuating element **18** and the guide members **50** is reduced, so that the actuating element **18** can be moved in the actuating direction B involving a smaller resistance.

Respective ramps **52** are provided between the projections **46** and the depressions **48** located behind the projections **46** as viewed in the actuating direction B. When the actuating element **18** is shifted in the actuating direction B, the protruding sections **40** of the spring elements **28** will reach these ramps **52** and, upon further shifting, will move into the depressions **48**.

With the protruding sections **40** arranged in the depressions, the spring force F, which presses the actuating element **18** against the guide members **50**, is reduced so that the actuating element **18** can be shifted in the actuating direction B by a smaller force. But the actuating element **18** is pressed against the guide members **50** also in these positions, so that the actuating element **18** is mounted free of clearance.

When the actuating element **18** is shifted from the basic position to an actuation position, the ramps **52** provide the advantage that as soon as the protruding sections **40** rest against the ramps **52**, a small actuating force is exerted on the actuating element **18** by the spring element **28** in the actuating direction B. This force is considerably smaller than the restoring force provided by the spring **24**. But since this force acts in the actuating direction B, it reduces the force that is required for shifting the actuating element **18**. As a result, the increased friction between the actuating element **18** and the seat **20** as caused by the spring force F, which presses the actuating element **18** against the inner wall of the seat **20** transversely to the actuating direction B, can be partly compensated.

In the embodiment shown here, the actuating assembly **16** includes two spring elements **28** which are arranged offset substantially by 90 degrees, so that they act on the actuating element **18** in two mutually perpendicular directions.

The number of spring elements **28** may, however, be adjusted as desired. In particular, it is conceivable that only one spring element **28** is used which, in the case of a square cross-section, for example, may be arranged in a corner and urge the actuating element **18** into the opposite corner.

The shape and material of the spring element **28** may be adjusted as desired. It should only be ensured that the spring element **28** exerts a spring force F that acts transversely to the actuating direction B on the actuating element **18**. An exchange or an adjustment of the spring element **28** allows a rapid elimination of the clearance between the actuating element **18** and the seat **20**.

The invention claimed is:

1. An actuating assembly (**16**) for a steering column stalk (**10**), comprising

an actuating element (**18**) that is adapted to be shifted in an actuating direction (B) between a basic position and at least one actuation position,

a seat (**20**) in which the actuating element (**18**) is shiftably supported, wherein at least one separate spring element (**28**) is provided between the seat (**20**) and the actuating element (**18**) and presses on the actuating element (**18**) by a spring force (F) acting substantially transversely to the actuating direction (B), and

guide members (**50**) located substantially opposite to the at least one spring element (**28**) and provided in the seat (**20**), the at least one spring element (**28**) pressing the actuating element (**18**) into engagement with a respective inner wall of the seat opposite the spring element.

2. The actuating assembly according to claim **1**, wherein the spring element (**28**) extends within the seat (**20**) in the actuating direction (B) and rests against an inner wall of the seat (**20**) at least in sections.

3. The actuating assembly according to claim **2**, wherein the spring element (**28**) includes protruding sections (**40**) which project from the inner wall of the seat (**20**).

4. An actuating assembly (**16**) for a steering column stalk (**10**), comprising:

an actuating element (**18**) that is adapted to be shifted in an actuating direction (B) between a basic position and at least one actuation position, wherein at least one projection (**46**) and/or one depression (**48**) is provided on the actuating element (**18**), and

a seat (**20**) in which the actuating element (**18**) is shiftably supported, wherein at least one separate spring element (**28**) is provided between the seat (**20**) and the actuating element (**18**) and presses on the actuating element (**18**) by a spring force (F) acting substantially transversely to the actuating direction (B), the spring element (**28**) resting, when said actuating element (**18**) is in the basic position, by a protruding section (**40**) against a projection (**46**) formed on an outer lateral face of the actuating element (**18**), and/or resting in a depression (**48**) formed on said outer lateral face of the actuating element (**18**) when said actuating element (**18**) is in an actuation position.

5. The actuating assembly according to claim **4**, wherein a ramp (**52**) for the protruding section (**40**) of the spring element is provided between a projection (**46**) and a depression (**48**) located behind the projection in the actuating direction (B).

6. The actuating assembly according to claim **1**, wherein the spring element (**28**) is a bent sheet metal part (**30**) which is pre-bent.

7. The actuating assembly according to claim **1**, wherein two spring elements (**28**) are provided which are arranged offset by 90 degrees in the circumferential direction.

8. A steering column stalk (**10**) comprising a mounting (**12**) for supporting the steering column stalk (**10**) or a steering column, and comprising an actuating assembly (**16**) according to claim **1**, wherein the seat (**20**) of the actuating assembly (**16**) is formed integrally with the steering column stalk (**10**).

9. A steering column stalk assembly comprising a steering column stalk (**10**) according to claim **8** and a vehicle-fixed bearing for accommodation of the mounting (**12**) of the steering column stalk (**10**), wherein the bearing includes a detent cam surface into which the actuating element (**18**) can engage.

10. The actuating assembly according to claim **1**, wherein the at least one spring element comprises a first spring element pressing a first side of the actuating element in a first direction perpendicular to the actuation direction and a second spring element pressing a second side of the actuating element in a second direction perpendicular to the actuation direction and perpendicular to the first direction.

11. The actuating assembly according to claim **1**, wherein the at least one spring element presses the actuating element when the actuating member is in the basic position and the actuating position.

12. The actuating assembly according to claim **1**, wherein each of the at least one spring element presses the actuating

element into engagement with a respective inner wall of the seat opposite the spring element.

13. An actuating assembly for a steering column stalk in a vehicle comprising:

a seat having an axial end defining a face;

an actuating element adapted to be shifted within the seat in an actuating direction between a basic position and an actuation position, and

at least one separate spring element provided between the seat and the actuating element for applying a spring force to the actuating element when the actuating element is in the basic position and the actuating position in a direction substantially transversely to the actuating direction, the at least one spring element being integrally formed with a basic section abutting the face of the seat.

14. An actuating assembly for a steering column stalk in a vehicle comprising:

a seat;

an actuating element adapted to be shifted within the seat in an actuating direction between a basic position and an actuation position, and

at least one separate spring element provided between the seat and the actuating element for applying a spring force to the actuating element when the actuating element is in the basic position and the actuating position in a direction substantially transversely to the actuating direction, wherein the at least one spring element comprises a first spring element pressing a first side of the actuating element in a first direction perpendicular to the actuation direction and a second spring element pressing a second side of the actuating element in a second direction perpendicular to the actuation direction and perpendicular to the first direction.

15. An actuating assembly for a steering column stalk in a vehicle comprising:

a seat;

an actuating element adapted to be shifted within the seat in an actuating direction between a basic position and an actuation position, and

at least one separate spring element provided between the seat and the actuating element for applying a spring force to the actuating element when the actuating element is in the basic position and the actuating position in a direction substantially transversely to the actuating direction, wherein the at least one spring element presses the actuating element into engagement with a respective inner wall of the seat opposite the spring element.

16. The actuating assembly according to claim **13**, wherein the actuating element is rectangular and includes a plurality of sides, each spring element having a rectangular shape extending longitudinally along one of the sides.

17. The actuating assembly according to claim **14**, wherein the actuating element is rectangular and includes a plurality of sides, each spring element having a rectangular shape extending longitudinally along one of the sides.

18. The actuating assembly according to claim **15**, wherein the actuating element is rectangular and includes a plurality of sides, each spring element having a rectangular shape extending longitudinally along one of the sides.

19. The actuating assembly according to claim **3**, wherein the spring element has an undulating configuration.

20. The actuating assembly according to claim **6**, wherein the spring element is pre-bent in an undulating shape.

21. The actuating assembly according to claim **7**, wherein the two spring elements are formed integrally with each other.

* * * * *